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iVIEW

EDITOR'S PAGE

Is Mechanical Dispersion a Raven of Ventricular Arrhythmias?

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The ancients believed a bird's flight could foretell the future (1) and Domitian looked to the raven to foretell his immediate future. Ironically, Suetonius, a Roman historian and senator, records, "A few months before he (Domitian) was killed, a raven perched on the Capitalium and cried, 'All will be well,' an omen which some interpreted as follows: . . . a raven . . . could not say, 'It is well,' only declared 'It will be well' " (2). Emperor Domitian died soon after and all was well (3)!

Serious ventricular arrhythmias account for the majority of sudden cardiac death after acute myocardial infarction (MI), and identification and treatment of patients at risk of sudden cardiac death remains a major focus of clinical practice (4). Implantable cardioverter defibrillators (ICD) have been the mainstay of therapy for this condition and are currently indicated in patients with reduced cardiac systolic function, based on a left ventricular ejection fraction (LVEF) <35%. Although ICD is effective in reducing the occurrence of sudden cardiac death the device never delivers therapy in a large proportion of recipients of an ICD based on reduced LVEF. Also, the majority of patients who die suddenly would not have qualified for ICD under current LVEF-based guidelines (5).

While a depressed LVEF portends a poor outcome, the accuracy of prediction of sudden cardiac death with LVEF alone is moderate to low. In the post-infarct setting, several studies have additionally focused on the electrical disturbance that occurs—including electrical dispersion evaluated with signal-averaged electrocardiograms, QT dispersion, and heart rate variability—with variable and somewhat disappointing results. Practically none of these methodologies are currently used clinically to further subclassify individuals at risk of sudden cardiac death and help refine ICD therapy. Thus, the quest to improve upon the accuracy of markers to predict serious arrhythmias is still an ongoing effort.

Echocardiographic imaging has evolved enormously, from the traditional measurement of left ventricular volumes and ejection fraction to, more recently, quantitation of regional function with elaborate parameters such as speckle tracking. These have included regional deformation parameters of strain and strain rate. Regional deformation can be accurately timed and compared throughout the ventricle. Thus, dyssynchrony of contraction can be measured, expressed as maximal time difference among segments or standard deviation of the time to maximal contraction. These parameters have been investigated to quantitate cardiac dyssynchrony and evaluate selection of patients for resynchronization therapy. In this issue of *iJACC*, Haugaa et al. (6) propose to use this parameter as an index of "mechanical dispersion"—an innovative suggestion for identifying patients at risk of ventricular arrhythmias.

The use of mechanical dispersion to predict ventricular arrhythmias is promising at first glance. The authors studied individuals after MI who had a clinical indication for an ICD, or patients who had an ICD for secondary prevention. The higher the index of mechanical dispersion, the more prevalent was a composite end point of ICD shocks for ventricular fibrillation or ventricular arrhythmias needing pace termination. This was seen in the primary and secondary prevention

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subjects. Mechanical dispersion was a strong and independent predictor of arrhythmias requiring ICD therapy. A mechanical dispersion of 70 ms showed a sensitivity of 65% and a specificity of 90% for identifying arrhythmic events. Possible limitations of such an index are in segments that display no deformation, where timing of contraction may be difficult. In addition, patients with a wide QRS complex on the electrocardiogram may already have a large mechanical dispersion. Finally, though a test with high specificity is welcome, less than perfect sensitivity may not allow the proposed test to become a part of routine clinical practice algorithm for management of a disease associated with high mortality.

The present dispersion index may represent the mechanical correlate of electrical or tissue heterogeneity seen after MI. Cardiac magnetic resonance imaging has demonstrated that tissue heterogeneity post-MI is related to increased susceptibility to ventricular arrhythmias induced by programmed ventricular stimulation (7). And, 2 months ago, *iJACC* also brought you data extracted from clinical studies based on the molecular imaging of neuronal dysfunction to predict appropriateness of ICD placement (8). The sympathetic nervous system is an important trigger for major arrhythmic events, and a mismatch of myocardial perfusion and innervation poses substantially greater risk. Whether the above mechanical, electrical, and histological indexes are correlated, additive, or merely provide redundant prognostic information needs to be evaluated in future prospective investigations. Nonetheless, combining imaging and electrophysiologic modalities should offer improved accuracy in future selection of patients with heart failure for ICD placement. While such novel imaging applications are of paramount interest, one cannot be too cautious when dealing with identification of new risk factors for predicting sudden cardiac death, as this condition is complex with numerous predisposing risks, frequently variable, dynamic, and even genetic!

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